

Examples

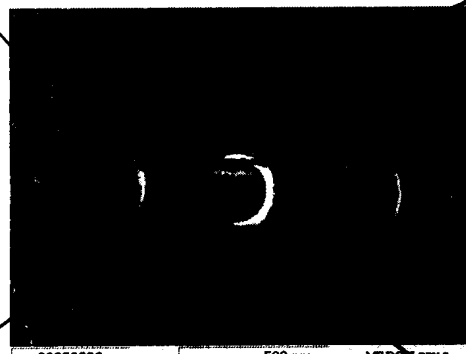
For better understanding and in order to illustrate the invention, examples are reproduced below, also in the form of pictures which show the cleaning result. The compositions used are within the scope of protection of the present invention. The examples thus also serve to illustrate the invention. Owing to the general validity of the inventive principle described, however, the examples are not suitable for reducing the scope of protection of the present application merely to these.

The temperatures given in the examples are always in °C.

Example 1

Reference (post-ash residue) before cleaning

Vias



AlCu lines



00058036 500 nm MERCK NEM-Team

00058185 1 µm MERCK NEM-Team

Add: FIGS. 14

FIG 15

The cleaning is carried out with an aqueous cleaning solution comprising the following components:

- | | |
|---------------------|----------|
| • citric acid | 5% |
| • hydrogen peroxide | 2% |
| • NMP | 1% |
| • Tween 20 | 1000 ppm |

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Process parameters for Semitool SAT spray tool:

Step	Name	Time	RPM	Temp.		DRAIN
1	Polymer removal	5 min	50 rpm	60°C		Tank
2	Purge	10 sec	50 rpm		N2	Tank
3	DI rinse 1	5 min	50 rpm	RT	H2O	Drain
4	DI rinse 2	2 min	300 rpm	RT		
4	Purge	10 sec	300 rpm		N2	Drain
5	Dry 1	2 min	750 rpm	hot	N2	
6	Dry 2	8 min	300 rpm	hot	N2	

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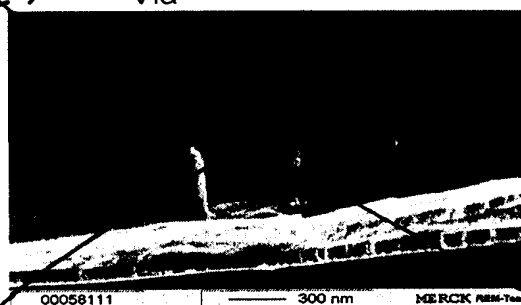
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AlCu lines



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Add: Drawing FIGS. 16

FIG. 17

Example 2

The cleaning is carried out with an aqueous cleaning solution comprising the following components:

- citric acid 5%
- hydrogen peroxide 2%
- oleic hydroxyethyl imidazoline 1000 ppm

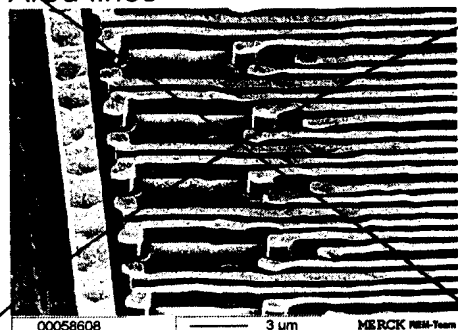
Process parameters for Arias wet bench

STEP	NAME	TIME	Temp		Drain
1	Polymer removal	20 min	60°C		
2	DI rinse 1	10 min	RT	H2O	
3	Dry 1	2 min	hot	N2	
4	Dry 2	8 min	hot	N2	

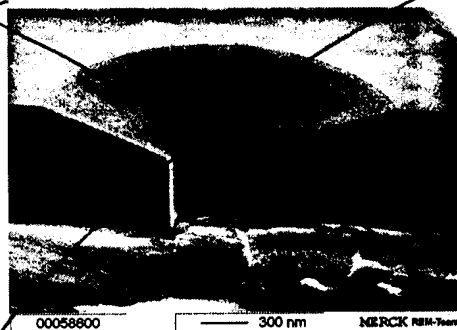
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AlCu lines



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Add: FIGS. 18

FIGS. 19

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Example 3

Comparison with a commercially available organic polymer remover

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1. Polymer remover (comprises hydroxylamine, catechol, monoethanolamine)

75°C, 20 min (beaker)

2. IPA RT, 3 min

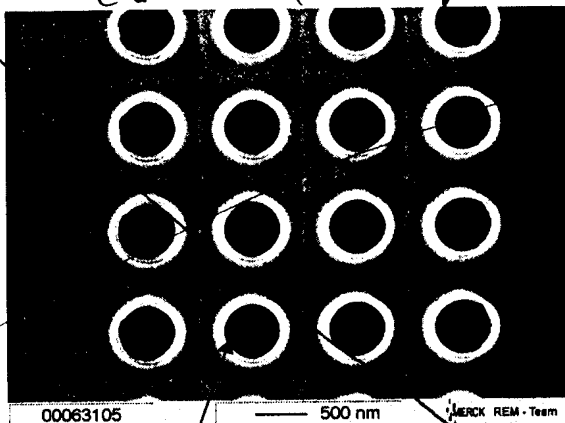
3. DI water RT, 5 min

4. N2 blow drying

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Add: FIG. 20

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Incipient etching of the AlCu metallisation

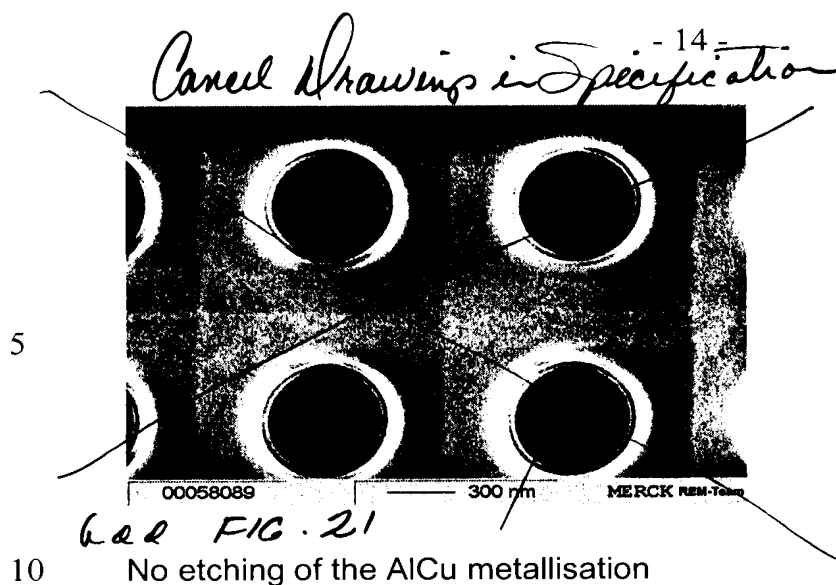
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1. Citric acid 5% / peroxide 2% / NMP 1% / Tween 20 1000 ppm

60°C, 20 min (beaker)

2. DI water 10 min

3. N2 blow drying



Explanation of figures:

Figure 5: Plot of mass removal of a sputtered Al/Cu layer as a function of exposure time. The solution used consisted of an aqueous solution of 5% of citric acid, 2% of peroxide, 1% of NMP. The dark curve shows removal without corrosion inhibitor. The pale line shows removal with addition of a corrosion inhibitor.

Figure 6: Plot of mass removal of a CVO-deposited tungsten layer as a function of exposure time. The solution used (see Figure 5).

Figure 13: Plot of the etching rate (removal/time) of various coatings, with/without addition of a corrosion inhibitor to the solution (see Figure 5).